

## FILE D

### **Mathematics:**

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# **Mathematics**

## **Item Information and Scoring Guide Reference Sheet and Quantities of Items by Type**

# Item Information and Scoring Guide Reference Sheet

The following pages are designed to assist you in understanding how Maine Educational Assessment (MEA) items are scored. These pages contain the text for each item accompanied by the following information.

- **MC#:** the multiple-choice item position
- **Key:** the letter of the correct answer for the multiple-choice item
- **Learning Results:** the content standard, followed by the performance indicator, that the item measured
- **SA#:** the short-answer item position
- **Learning Results:** the content standard, followed by the performance indicator, that the item measured
- **Short-Answer Scoring Guide:** the two-point description used to determine the score
- **Training Notes:** in-depth descriptions or particular information used to determine the score
- **CR#:** the constructed-response item position
- **Learning Results:** the content standard, followed by the performance indicator, that the item measured
- **Constructed-Response Scoring Guide:** the four-point description used to determine the score
- **Training Notes:** in-depth descriptions or particular information used to determine the score

## **MAINE 2001–2002**

### **Mathematics Grade 8**

The table below shows the quantities of released items for each item type. Item information for all item types and scoring information (guides and training notes) for all short-answer and constructed-response items follow.

#### **QUANTITIES OF ITEMS BY TYPE**

<b>MC</b>	<b>SA</b>	<b>CR</b>
20	5	4

**Items with Keys, Learning Results, Scoring Guides,  
Training Notes, and Student Responses**

1. Which is greatest?

A.  $100 + (-16.7)$

B.  $100 - (18.3)$

C.  $100 \times 0.531$

D.  $100 \div 0.23$

**MC#: 1**

**Key: D**

**Learning Results: A-2**

Numbers and Number Sense

A Students will understand and demonstrate a sense of what numbers mean and how they are used.  
Students will be able to

2 demonstrate understanding of the relationships among the basic arithmetic operations on different types of numbers.

2. Compute:

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16}$$

A.  $\frac{4}{16}$

B.  $\frac{1}{30}$

C.  $\frac{15}{16}$

D.  $\frac{4}{30}$

**MC#: 2**

**Key: C**

**Learning Results: B-1**

Computation

- B Students will understand and demonstrate computation skills. Students will be able to  
1 compute and model all four operations with whole numbers, fractions, decimals, sets of numbers, and percents, applying the proper order of operations.

3. How many **prime numbers** are between 6 and 15?
- A. 1
  - B. 2
  - C. 3
  - D. 4

**MC#: 3**

**Key: C**

**Learning Results: A-3**

Numbers and Number Sense

- A Students will understand and demonstrate a sense of what numbers mean and how they are used.  
Students will be able to
- 3 apply concepts of ratios, proportions, percents, and number theory (e.g., primes, factors, and multiples) in practical and other mathematical situations.



Term 1   Term 2   Term 3   Term 4

4. Which rule describes the number of tiles in the  $n$ th term?

A.  $2n - 1$   
B.  $2n - 2$   
C.  $n$   
D.  $n + 2$

**MC#: 4**

**Key: A**

**Learning Results: I-2**

Discrete Mathematics

- 1     Students will understand and apply concepts in discrete mathematics. Students will be able to  
2     identify patterns in the world and express these patterns with rules.

5. What is the value of the expression below?

$$6 + 2 \times 9 - 8 \div 2$$

- A. 32
- B. 20
- C. 8
- D. 4

**MC#: 5**

**Key: B**

**Learning Results: B-1**

Computation

- B Students will understand and demonstrate computation skills. Students will be able to
- 1 compute and model all four operations with whole numbers, fractions, decimals, sets of numbers, and percents, applying the proper order of operations.

9. a. Express  $4^3$  as a whole number.  
b. If  $2^x = 32$ , what is  $x$ ?

**SA#: 9**

**Learning Results: A-1**

Numbers and Number Sense

- A Students will understand and demonstrate a sense of what numbers mean and how they are used.  
Students will be able to
- 1 use numbers in a variety of equivalent and interchangeable forms (e.g., integer, fraction, decimal, percent, exponential, and scientific notation) in problem solving.

### SHORT-ANSWER SCORING GUIDE

Score	Description
2	Student correctly answers both parts a and b.
1	Student correctly answers either part a or part b.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

### Training Notes for Short-Answer #9

Correct answers:

Part a. 64

Part b. 5

Student Responses for Short-Answer #9 for Score Points 2 and 1

9. 2

a)  $4 \cdot 4 \cdot 4$   $\frac{16}{64}$   
 $(64)$

b)  $(2)2=4(2)=8(2)=16(2)=32$   
 $\uparrow \uparrow \uparrow \uparrow \uparrow$   
 $x=5$

9. 2

a)  $4^3 = 4 \cdot 4 \cdot 4$   
 $16 \cdot 4 = (64)$

b)  $2^x = 32$   
 $2^x = 32$  when  $x=5$   
 $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$

9. 1

a)  $4^3 = 64$

b)  $2^x = 32$   $2 \div 32$   
 $x = 16$

9. 1

$2^x = 32$   $2 \times 2 \times 2 \times 2 \times 2 = 32$   
 $x=5$

10. a. What is the **greatest common factor** (GCF) of 15 and 20?  
b. What is the **least common multiple** (LCM) of 14 and 35?

**SA#: 10**

**Learning Results: A-3**

Numbers and Number Sense

- A Students will understand and demonstrate a sense of what numbers mean and how they are used.  
Students will be able to
- 3 apply concepts of ratios, proportions, percents, and number theory (e.g., primes, factors, and multiples) in practical and other mathematical situations.

### SHORT-ANSWER SCORING GUIDE

Score	Description
2	Student correctly answers both parts a and b.
1	Student correctly answers either part a or part b.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

### Training Notes for Short-Answer #10

Correct answers:

Part a. 5

Part b. 70

Student Responses for Short-Answer #10 for Score Points 2 and 1

10. 2

A. 5  
B. 70

10. 2

a. 15 - 1, 3, 5, 15  
20 - 1, 2, 5, 10, 20    5

b. 14 - 28, 42, 56, 70  
35 - 70    70

10. 1

a. 5  
b. 130

14: 14, 28, 42, 56, 70, 84, 98, 112, 126, 140, 154, 168, 182, 196, 210, 224, 238, 252, 266, 280, 294, 308, 322, 336, 350, 364, 378, 392, 406, 420, 434, 448, 462, 476, 490, 504, 518, 532, 546, 560, 574, 588, 602, 616, 630, 644, 658, 672, 686, 700, 714, 728, 742, 756, 770, 784, 798, 812, 826, 840, 854, 868, 882, 896, 910, 924, 938, 952, 966, 980, 994, 1008, 1022, 1036, 1050, 1064, 1078, 1092, 1106, 1120, 1134, 1148, 1162, 1176, 1190, 1204, 1218, 1232, 1246, 1260, 1274, 1288, 1302, 1316, 1330, 1344, 1358, 1372, 1386, 1400, 1414, 1428, 1442, 1456, 1470, 1484, 1498, 1512, 1526, 1540, 1554, 1568, 1582, 1596, 1610, 1624, 1638, 1652, 1666, 1680, 1694, 1708, 1722, 1736, 1750, 1764, 1778, 1792, 1806, 1820, 1834, 1848, 1862, 1876, 1890, 1904, 1918, 1932, 1946, 1960, 1974, 1988, 2002, 2016, 2030, 2044, 2058, 2072, 2086, 2100, 2114, 2128, 2142, 2156, 2170, 2184, 2198, 2212, 2226, 2240, 2254, 2268, 2282, 2296, 2310, 2324, 2338, 2352, 2366, 2380, 2394, 2408, 2422, 2436, 2450, 2464, 2478, 2492, 2506, 2520, 2534, 2548, 2562, 2576, 2590, 2604, 2618, 2632, 2646, 2660, 2674, 2688, 2702, 2716, 2730, 2744, 2758, 2772, 2786, 2800, 2814, 2828, 2842, 2856, 2870, 2884, 2898, 2912, 2926, 2940, 2954, 2968, 2982, 2996, 3010, 3024, 3038, 3052, 3066, 3080, 3094, 3108, 3122, 3136, 3150, 3164, 3178, 3192, 3206, 3220, 3234, 3248, 3262, 3276, 3290, 3304, 3318, 3332, 3346, 3360, 3374, 3388, 3402, 3416, 3430, 3444, 3458, 3472, 3486, 3500, 3514, 3528, 3542, 3556, 3570, 3584, 3598, 3612, 3626, 3640, 3654, 3668, 3682, 3696, 3710, 3724, 3738, 3752, 3766, 3780, 3794, 3808, 3822, 3836, 3850, 3864, 3878, 3892, 3906, 3920, 3934, 3948, 3962, 3976, 3990, 4004, 4018, 4032, 4046, 4060, 4074, 4088, 4102, 4116, 4130, 4144, 4158, 4172, 4186, 4200, 4214, 4228, 4242, 4256, 4270, 4284, 4298, 4312, 4326, 4340, 4354, 4368, 4382, 4396, 4410, 4424, 4438, 4452, 4466, 4480, 4494, 4508, 4522, 4536, 4550, 4564, 4578, 4592, 4606, 4620, 4634, 4648, 4662, 4676, 4690, 4704, 4718, 4732, 4746, 4760, 4774, 4788, 4802, 4816, 4830, 4844, 4858, 4872, 4886, 4900, 4914, 4928, 4942, 4956, 4970, 4984, 4998, 5012, 5026, 5040, 5054, 5068, 5082, 5096, 5110, 5124, 5138, 5152, 5166, 5180, 5194, 5208, 5222, 5236, 5250, 5264, 5278, 5292, 5306, 5320, 5334, 5348, 5362, 5376, 5390, 5404, 5418, 5432, 5446, 5460, 5474, 5488, 5502, 5516, 5530, 5544, 5558, 5572, 5586, 5600, 5614, 5628, 5642, 5656, 5670, 5684, 5698, 5712, 5726, 5740, 5754, 5768, 5782, 5796, 5810, 5824, 5838, 5852, 5866, 5880, 5894, 5908, 5922, 5936, 5950, 5964, 5978, 5992, 6006, 6020, 6034, 6048, 6062, 6076, 6090, 6104, 6118, 6132, 6146, 6160, 6174, 6188, 6202, 6216, 6230, 6244, 6258, 6272, 6286, 6300, 6314, 6328, 6342, 6356, 6370, 6384, 6398, 6412, 6426, 6440, 6454, 6468, 6482, 6496, 6510, 6524, 6538, 6552, 6566, 6580, 6594, 6608, 6622, 6636, 6650, 6664, 6678, 6692, 6706, 6720, 6734, 6748, 6762, 6776, 6790, 6804, 6818, 6832, 6846, 6860, 6874, 6888, 6902, 6916, 6930, 6944, 6958, 6972, 6986, 7000, 7014, 7028, 7042, 7056, 7070, 7084, 7098, 7112, 7126, 7140, 7154, 7168, 7182, 7196, 7210, 7224, 7238, 7252, 7266, 7280, 7294, 7308, 7322, 7336, 7350, 7364, 7378, 7392, 7406, 7420, 7434, 7448, 7462, 7476, 7490, 7504, 7518, 7532, 7546, 7560, 7574, 7588, 7602, 7616, 7630, 7644, 7658, 7672, 7686, 7700, 7714, 7728, 7742, 7756, 7770, 7784, 7798, 7812, 7826, 7840, 7854, 7868, 7882, 7896, 7910, 7924, 7938, 7952, 7966, 7980, 7994, 8008, 8022, 8036, 8050, 8064, 8078, 8092, 8106, 8120, 8134, 8148, 8162, 8176, 8190, 8204, 8218, 8232, 8246, 8260, 8274, 8288, 8302, 8316, 8330, 8344, 8358, 8372, 8386, 8400, 8414, 8428, 8442, 8456, 8470, 8484, 8498, 8512, 8526, 8540, 8554, 8568, 8582, 8596, 8610, 8624, 8638, 8652, 8666, 8680, 8694, 8708, 8722, 8736, 8750, 8764, 8778, 8792, 8806, 8820, 8834, 8848, 8862, 8876, 8890, 8904, 8918, 8932, 8946, 8960, 8974, 8988, 9002, 9016, 9030, 9044, 9058, 9072, 9086, 9100, 9114, 9128, 9142, 9156, 9170, 9184, 9198, 9212, 9226, 9240, 9254, 9268, 9282, 9296, 9310, 9324, 9338, 9352, 9366, 9380, 9394, 9408, 9422, 9436, 9450, 9464, 9478, 9492, 9506, 9520, 9534, 9548, 9562, 9576, 9590, 9604, 9618, 9632, 9646, 9660, 9674, 9688, 9702, 9716, 9730, 9744, 9758, 9772, 9786, 9800, 9814, 9828, 9842, 9856, 9870, 9884, 9898, 9912, 9926, 9940, 9954, 9968, 9982, 9996, 10000.

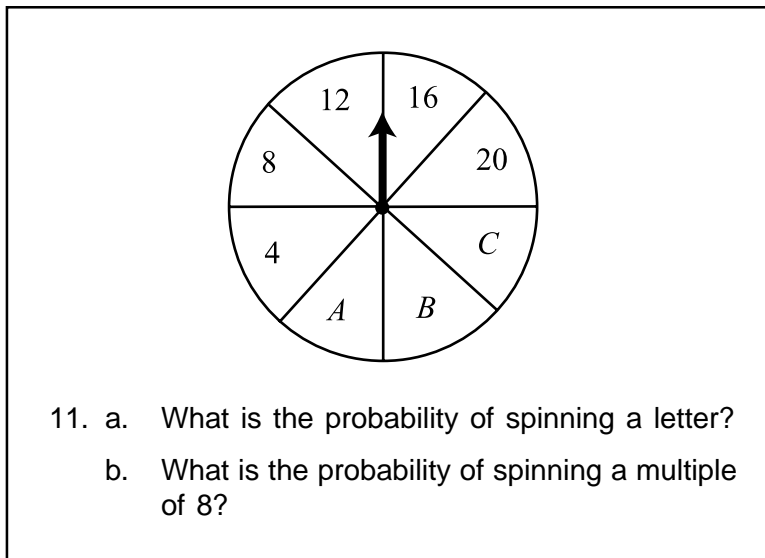
10. 1

a. 60  
b. 70

15/20  
30/40  
45/60  
60/80

35  
x 2  
70

14  
x 5  
70



**SA#: 11**

**Learning Results: D-1**

Probability

D Students will understand and apply concepts of probability. Students will be able to  
1 find the probability of simple events and make predictions by applying the theories of probability.

### SHORT-ANSWER SCORING GUIDE

Score	Description
2	Student correctly answers both parts a and b.
1	Student correctly answers either part a or part b.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

### Training Notes for Short-Answer #11

Correct answers:

Part a.  $\frac{3}{8}$  or equivalent

Part b.  $\frac{2}{8}$  or  $\frac{1}{4}$  or equivalent

11. 2

A.  $\frac{3}{8}$

B.  $\frac{2}{8}$

11. 2

a. the probability of spinning a letter is  $\frac{3}{8}$  or 3:8

b. the probability of spinning a multiple of 2 is  $\frac{2}{8}$  or  $\frac{1}{4}$  (or 2:8 or 1:4)

11. 1

a.  $\frac{3}{8}$




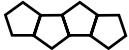
B.  $\frac{1}{8}$

11. 1

A 3 out of 8

B. 5 out of 8



TRAIN	NUMBER OF PENTAGONS	PERIMETER
	1	5
	2	8
	3	11
	4	14

12. a. What is the perimeter of a train of 5 pentagons?
- b. Write an algebraic expression for the perimeter of a train of  $n$  pentagons.

**SA#: 12**

**Learning Results: I-2**

Discrete Mathematics

- 1 Students will understand and apply concepts in discrete mathematics. Students will be able to
- 2 identify patterns in the world and express these patterns with rules.

### SHORT-ANSWER SCORING GUIDE

Score	Description
2	Student correctly answers both parts a and b.
1	Student correctly answers either part a or part b.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

### Training Notes for Short-Answer #12

Correct answers:

Part a. 17

Part b.  $3n + 2$

Student Responses for Short-Answer #12 for Score Points 2 and 1

12. a)  $n=3$  | 12 b  $A=3$  2

$1n+2$   
 $1 \times n+2=5$   
 $2n+2$   
 $6+2$   
 $5+3+2=17$

$na+2$   
 $n$   
 $3n+2$   
 $\frac{3n+2}{3} = \frac{17}{3}$   
 $n=-1$

$n=-1$

12. 2

A) the perimeter is 17 of a chain of 5 pentagons.

B)  $y = 3n+2$

12. 1

a. (Add three)  $14+3$

$P=17$

b.  $N+3=29$

12. 1

a. 

1	2	3	4	5
5	8	11	14	17

$+3$   $+3$   $+3$   $+3$

b

$4n+3$

17

13. Solve for  $x$  in the inequality below. Show your work or explain the steps you used to solve the inequality.

$$3x - 21 < 3$$

**SA#: 13**

**Learning Results: H-6**

Algebra Concepts

H Students will understand and apply algebraic concepts. Students will be able to

6 find solutions for unknown quantities in linear equations and in simple equations and inequalities.

### SHORT-ANSWER SCORING GUIDE

Score	Description
2	Student provides correct answer as an inequality or graph and gives an indication of strategy.
1	Student provides correct answer OR correct strategy.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

### Training Notes for Short-Answer #13

Correct answers:

$$3x - 21 < 3$$

$$3x < 24$$

$$x < 8$$

Student Responses for Short-Answer #13 for Score Points 2 and 1

13.  $x < 8$  2

$$3x - 21 < 3$$

$$= 3x + -21 < 3$$

$$= 3x < 24$$

$$= x < 8$$

13.  $3x - 21 < 3$  2

$$3 + 21 = 24 \quad 24 \div 3 = 8$$

$$x < 8$$

13.  $3x - 21 < 3$  1

$$\begin{array}{r} 3x - 21 < 3 \\ +21 \quad +21 \\ \hline 3x < 24 \\ \div 3 \quad \div 3 \\ \hline x < 8 \end{array}$$

13.  $3x - 21 < 3$  1

$$\begin{array}{r} 3x - 21 < 3 \\ +21 \quad +21 \\ \hline 3x < 24 \\ \div 3 \quad \div 3 \\ \hline x < 8 \end{array}$$

5 6 7 8 9 10 11

YEAR	AVERAGE GLOBAL TEMP. (°F)
1880	58.1°F
1900	58.6°F
1920	58.8°F
1940	59.2°F
1960	59.4°F
1980	59.7°F

16. Use the grids in your Student Response Booklet to answer this question. On both grids, put Year along the horizontal axis.
- Suppose you were creating a graph to go with an article claiming that the average global temperature is rising at an alarming rate. Graph the data so it appears that the average global temperature is rising rapidly.
  - Suppose you were creating a graph to go with an article claiming that the average global temperature is not rising quickly. Graph the data so it appears that the average global temperature is rising very slowly.

CR#: 16

**Learning Results: C-2**

Data Analysis and Statistics

- C Students will understand and apply concepts of data analysis. Students will be able to
- 2 assemble data and use matrices to formulate and solve problems.

### CONSTRUCTED-RESPONSE SCORING GUIDE

Score	Description
4	Student demonstrates thorough understanding of graphic presentation of data by accurately creating two graphs that each represent a set of data differently.
3	Student demonstrates general understanding of graphic presentation of data by creating two graphs that each represent a set of data differently with only minor errors or omissions.
2	Student demonstrates basic ability to create graphs that represent data.
1	Student demonstrates minimal ability to create graphs that represent data.
0	Response is totally incorrect or correct only in ways irrelevant to what is being measured.
Blank	No response.

## Training Notes for Constructed-Response #16

Score	Description
4	Student creates 2 graphs that have axes labeled, data graphed correctly, and plotted data in 1 <sup>st</sup> graph has a much greater slope than the plotted data in the 2 <sup>nd</sup> graph. For the slope on the 1 <sup>st</sup> graph to be greater EITHER, on the 1 <sup>st</sup> graph, the distance between any two temperatures (58° and 59°, for example) is <b>greater</b> than the distance between the same two temperatures on the 2 <sup>nd</sup> graph OR, on the 1 <sup>st</sup> graph, the distance between any two years (1880 and 1900, for example) is <b>less</b> than the distance between the same two years on the 2 <sup>nd</sup> graph.
3	Student creates 2 graphs that have axes labeled and appropriate differences in scale shown, but some of the data is not properly graphed.  OR Student creates 2 graphs with appropriate differences in scale shown. There may be minor errors or omissions.
2	Student graphs the data on one graph that shows appropriate scale. There may be minor errors.  OR Student creates 2 graphs but does not have enough difference in scale to give the appearance of different rates of change. There may be minor errors.
1	Student response shows minimal understanding by showing some correct strategy in making a graph.
0	Response is totally incorrect or irrelevant.
Blank	No response.

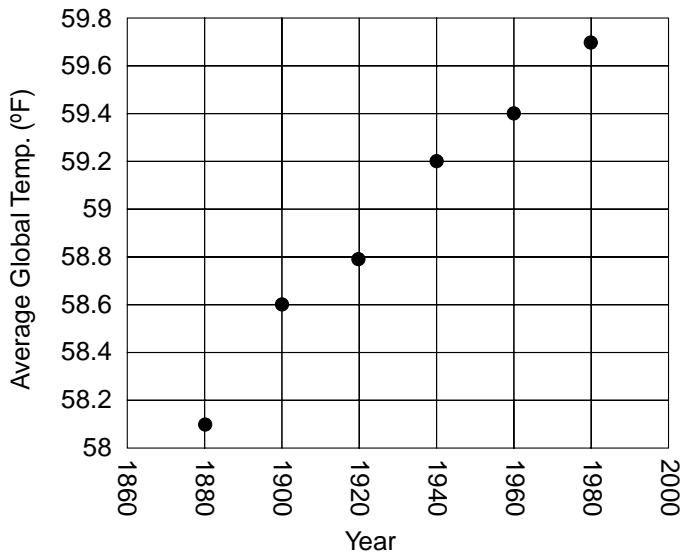
### Scoring information:

- The scale does NOT have to (nor SHOULD it) start at (0,0). The key idea here is to change one of the scales enough to show differences in rate changes.
- Do not deduct points if student does not connect the dots.
- Deduct 1 point from the score total if students put the years along the y-axis.

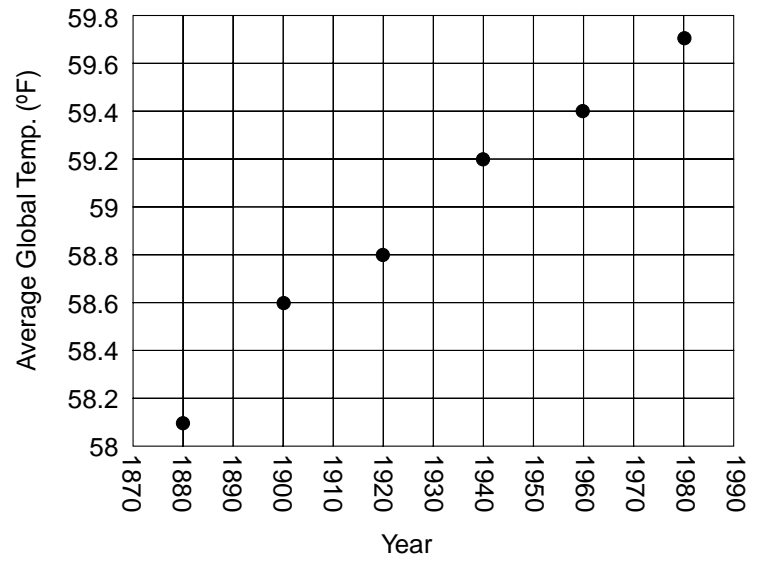
### Minor errors:

- Word labels missing.
- Some scale increments missing or mislabeled.
- Some points not placed correctly.

**Graph A**



**Graph B**

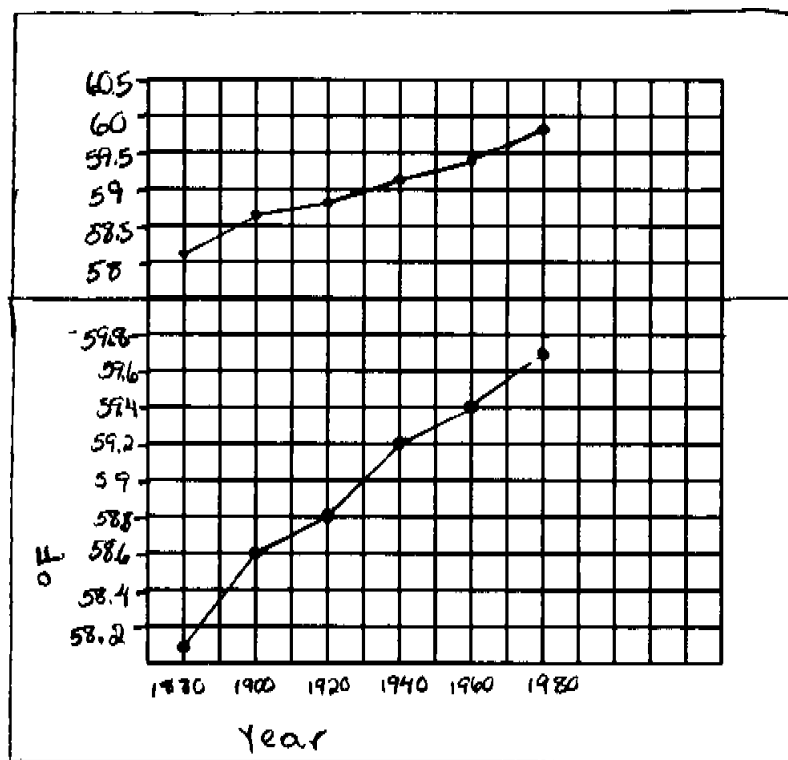


16.

4

B

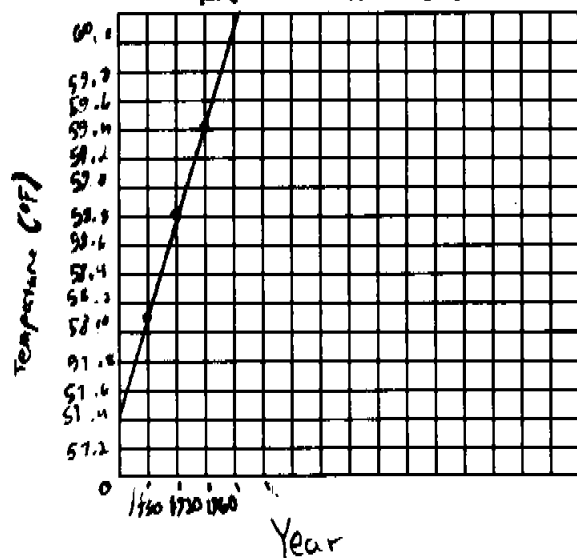
A



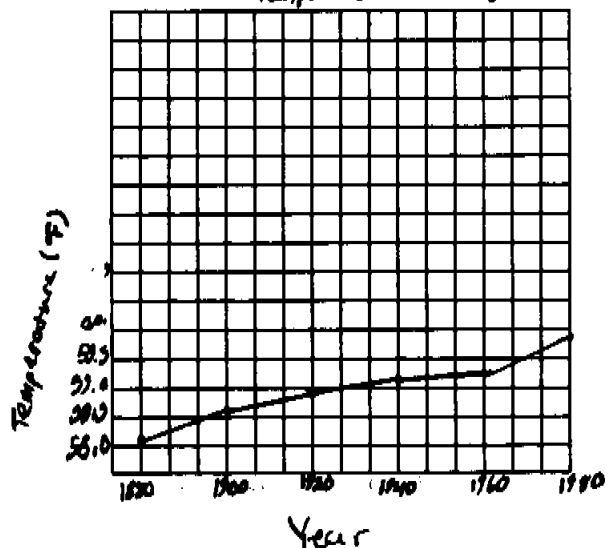
16.

4

How rapidly is the Average Global Temperature Increasing?



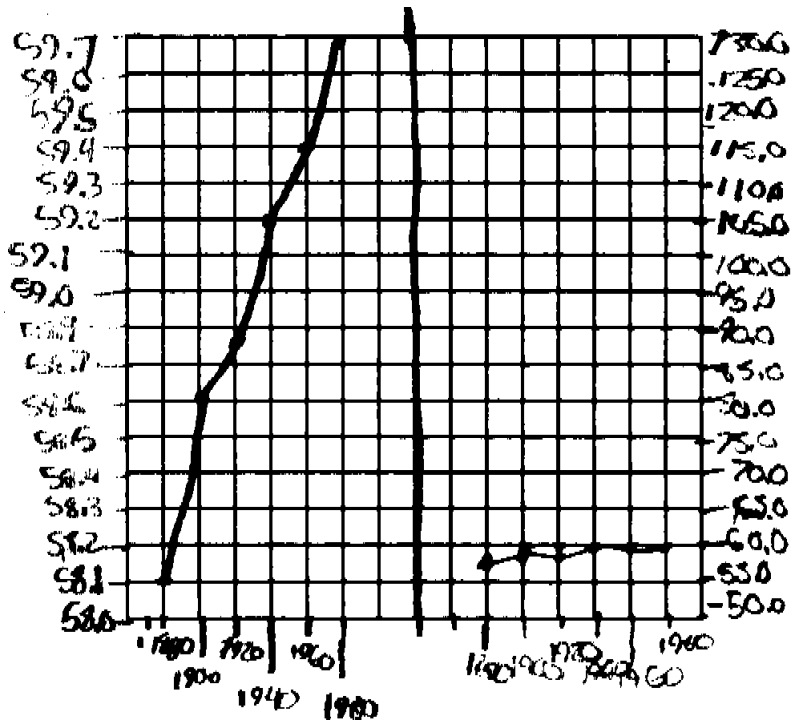
How slowly is the Average Global Temperature Increasing?





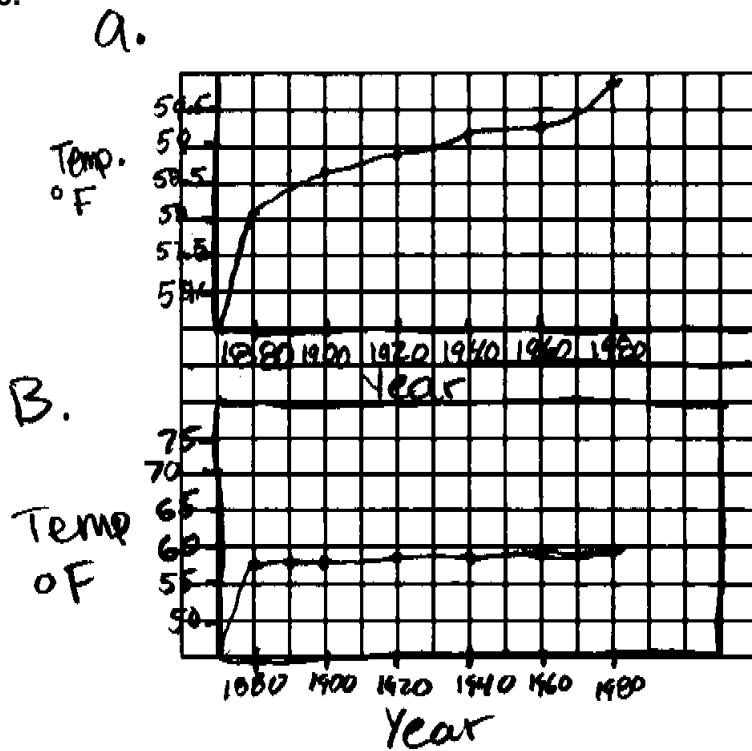
16.

3



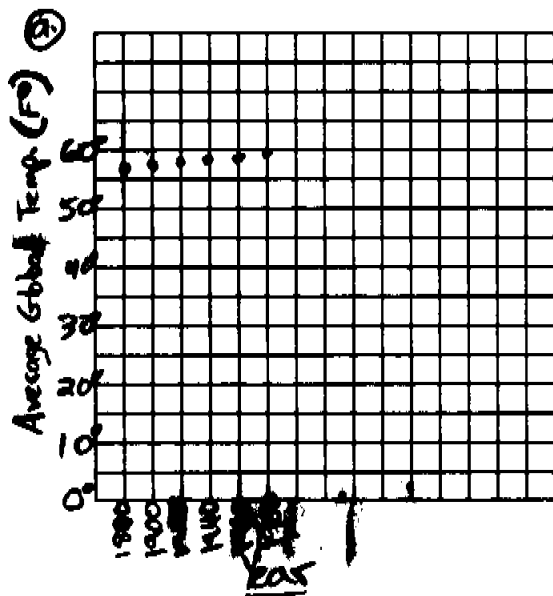
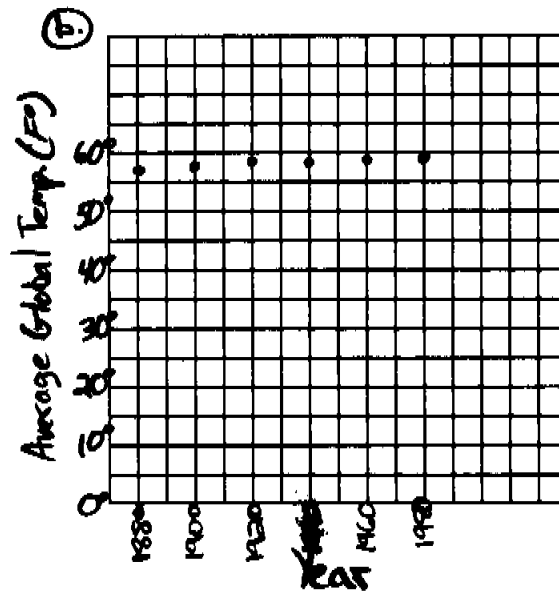
16.

3



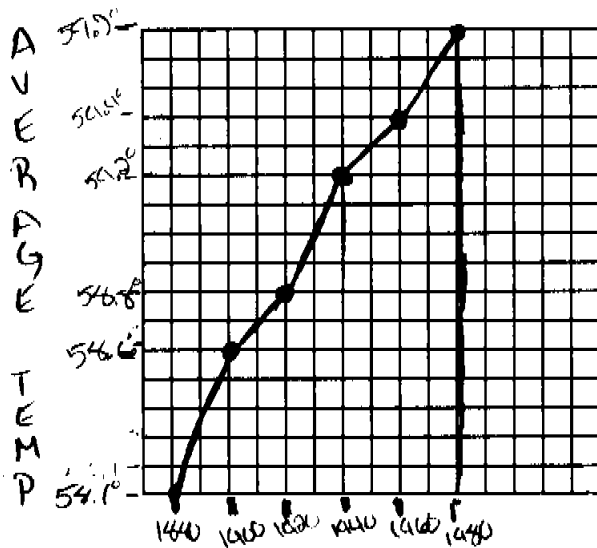
16.

2

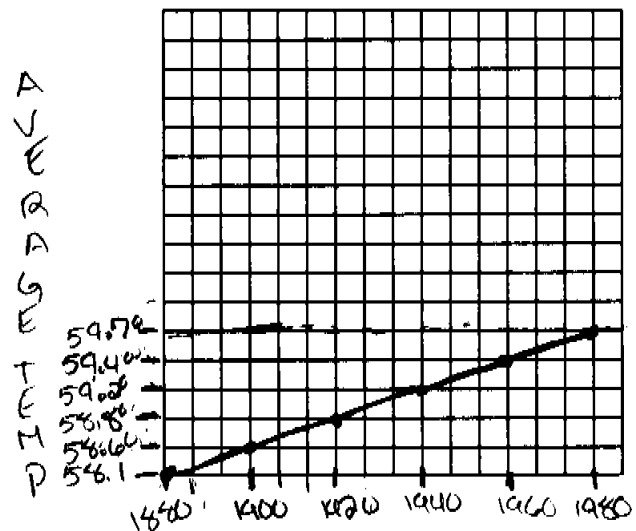
Average Global Temp.Average Global Temp.

16.

2



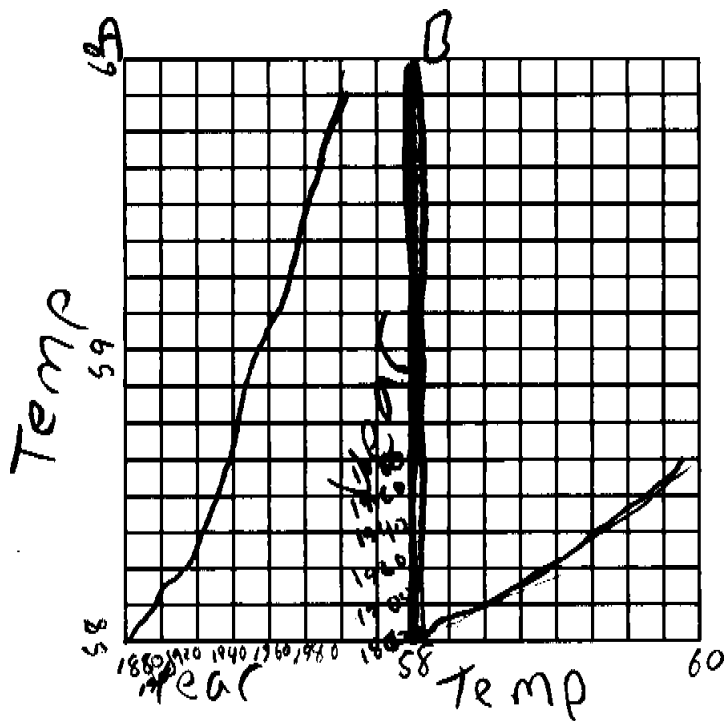
year  
a lot



year  
not a lot

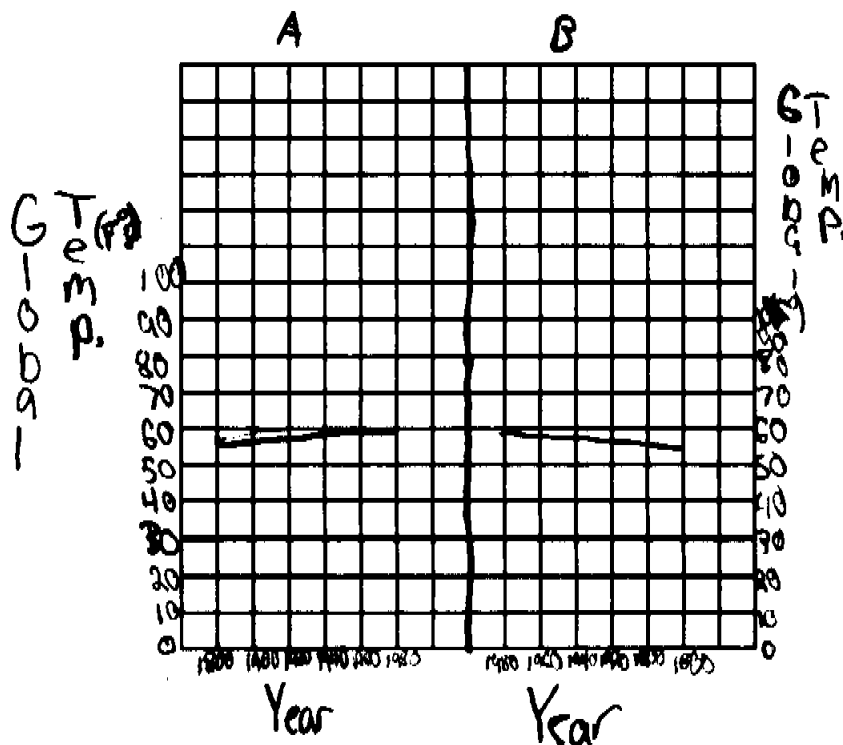
16.

1



16.

1



17. Use the protractor and ruler on the Mathematics Reference Sheet to draw a trapezoid with a base length of 4 inches, a leg of  $1\frac{3}{4}$  inches, and base angles of  $45^\circ$  and  $70^\circ$ . Label the  $45^\circ$  and  $70^\circ$  angles and the 4-inch and  $1\frac{3}{4}$ -inch sides.

**CR#: 17**

**Learning Results: E-4**

Geometry

- E Students will understand and apply concepts from geometry. Students will be able to  
4 use the appropriate geometric tools and measurements to draw and construct two and three dimensional figures.

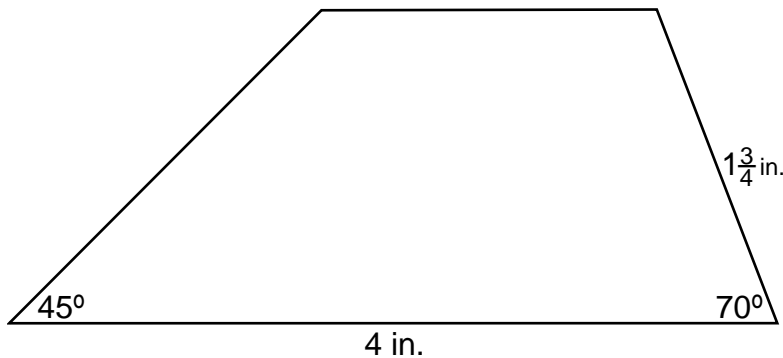
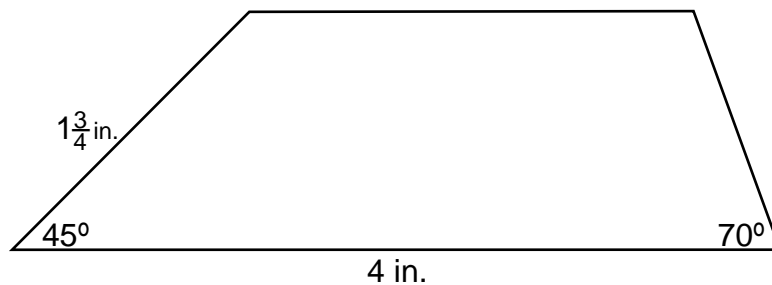
### CONSTRUCTED-RESPONSE SCORING GUIDE

Score	Description
4	Student demonstrates thorough understanding of the use of geometric tools and measurements to accurately draw and measure a trapezoid of specific dimensions.
3	Student demonstrates general understanding of the use of geometric tools and measurements to draw and measure a trapezoid of specific dimensions, with only a minor error or omission.
2	Student demonstrates basic understanding of the use of geometric tools and measurements by successfully completing a significant portion of the assigned tasks.
1	Student demonstrates minimal understanding the use of geometric tools or measurement.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

### Training Notes for Constructed-Response #17

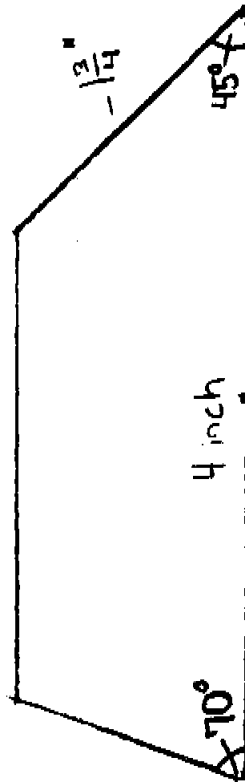
Score	Description
4	Student draws a trapezoid with correct measurements (angles $\pm 3^\circ$ and lengths $\pm 1/8$ inches) and with the given angles and sides labeled.
3	Student draws a trapezoid but 1 side or 1 angle is not drawn correctly. OR Student draws the trapezoid correctly, but the given angles and sides are not labeled or are incorrectly labeled.
2	Student draws a quadrilateral with at least 2 features (2 angles or 2 sides or 1 angle and 1 side) drawn correctly.
1	Student draws a quadrilateral with 1 feature drawn correctly.
0	Response is totally incorrect or correct only in ways irrelevant to what is being measured.
Blank	No response.

The figure should be congruent to (or within the given limits of) one of the figures below.



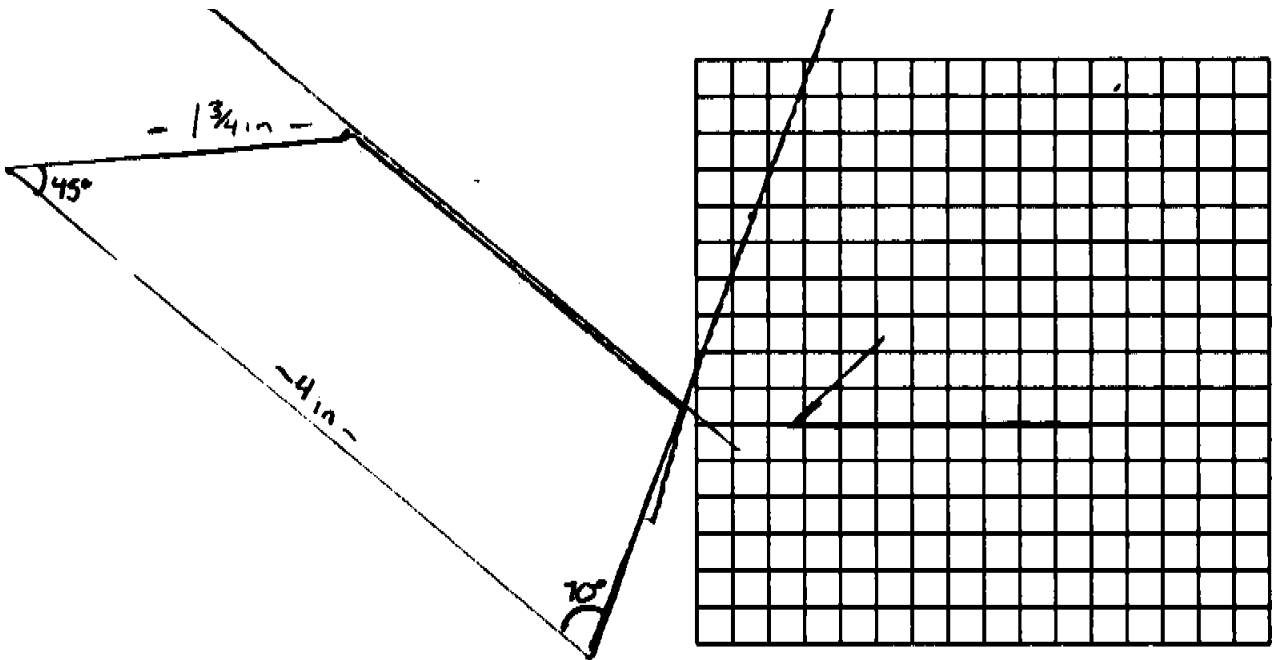
17.

Trapezoid



4

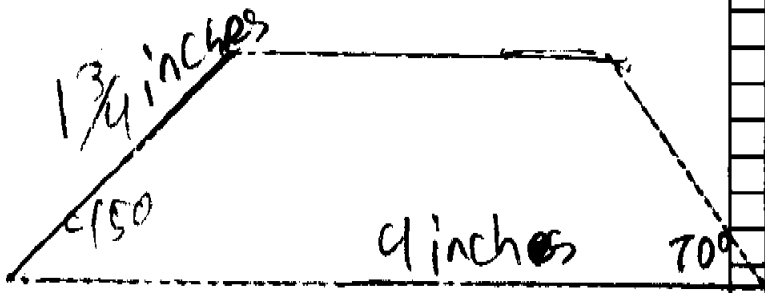
17.



4

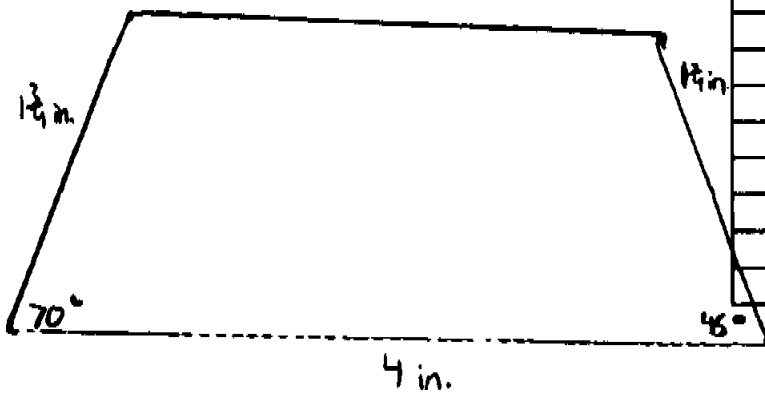
17.

3



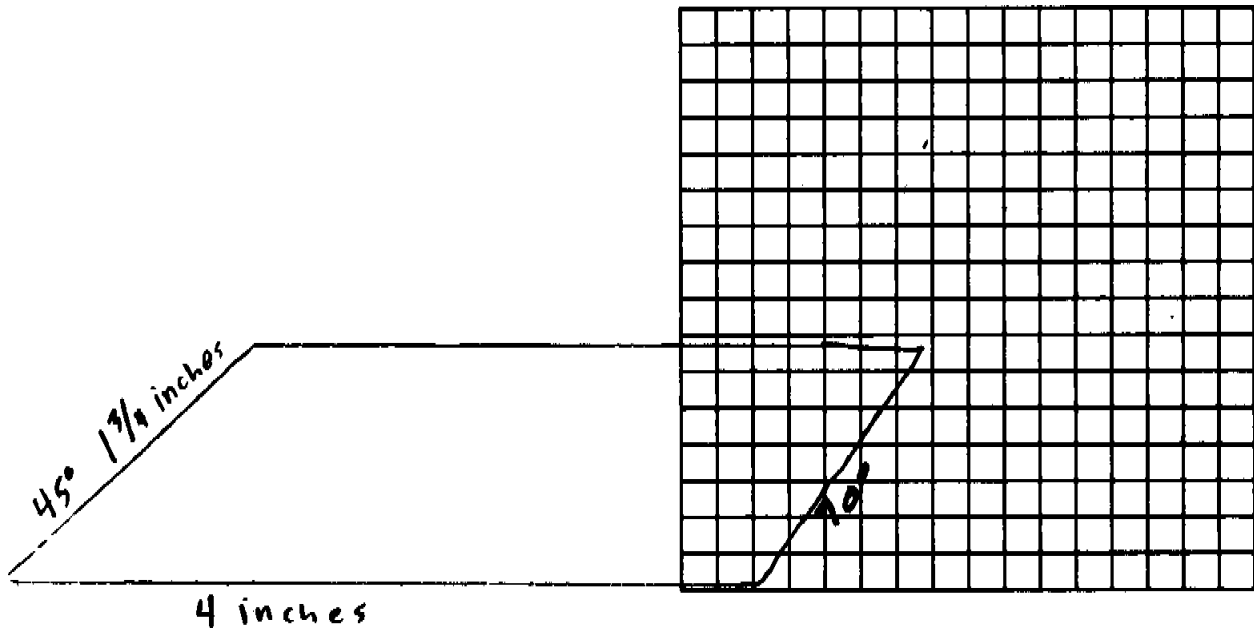
17.

3



17.

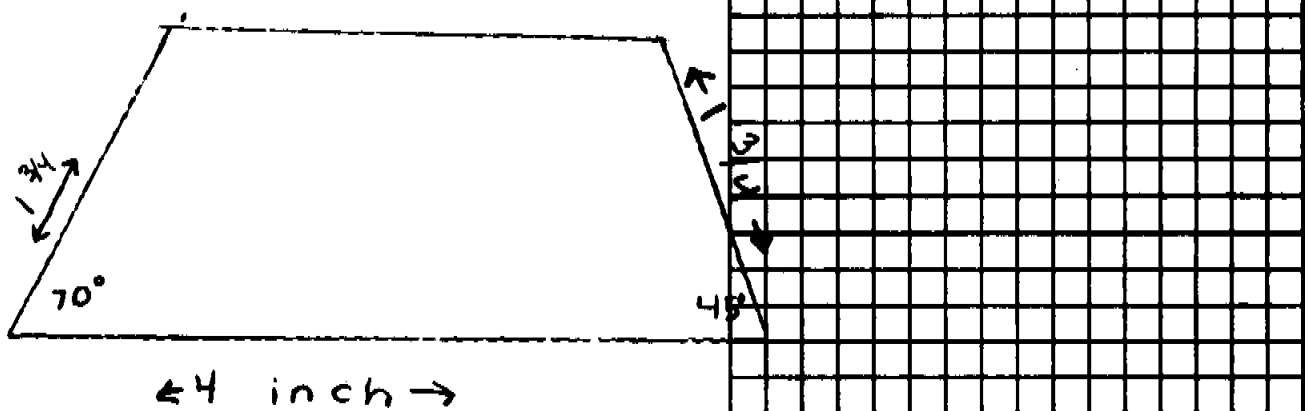
2



17.

2

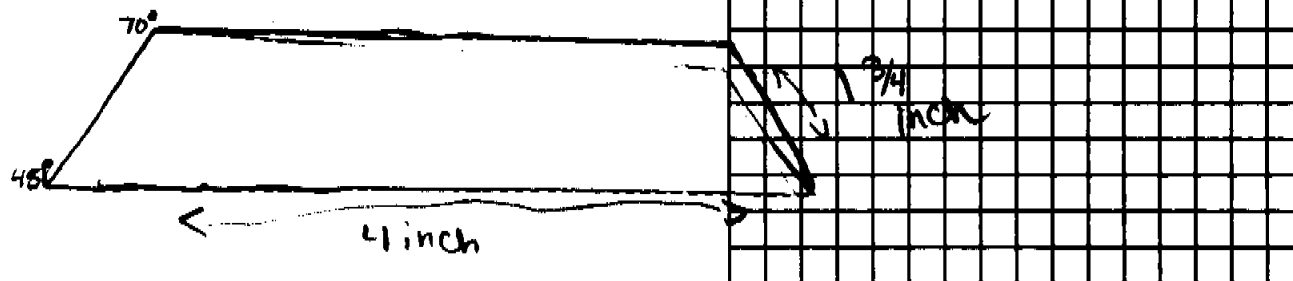
TRAPEZOID





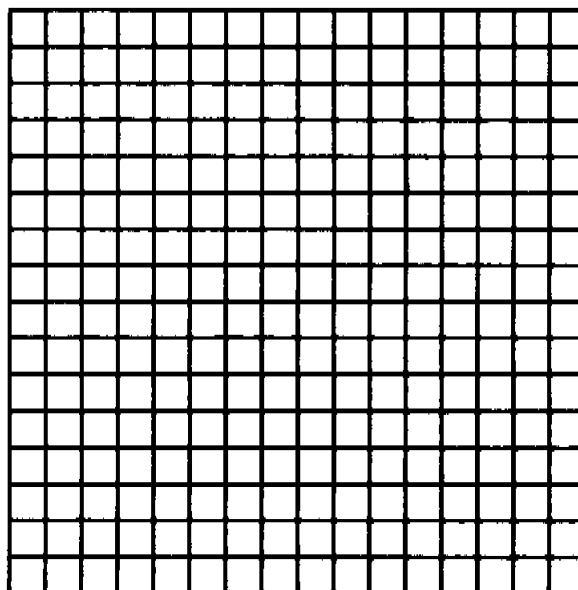
17.

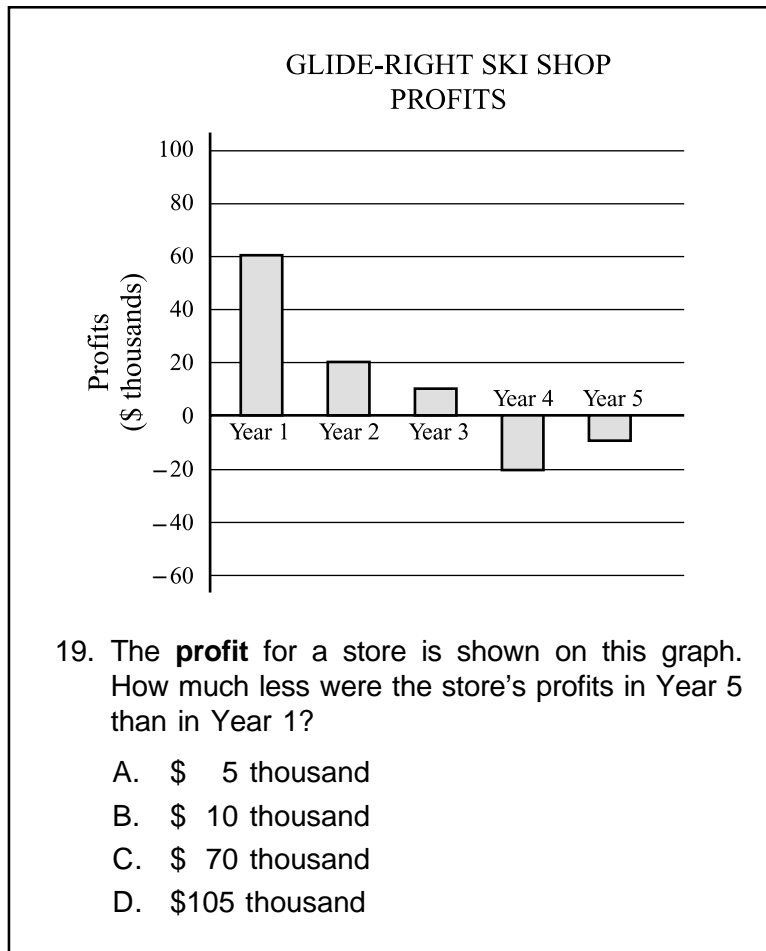
1



17.

1





**MC#: 19**

**Key: C**

**Learning Results: G-3**

Patterns, Relations, Functions

G Students will understand that mathematics is the science of patterns, relationships and functions. Students will be able to

3 use patterns and multiple representations to solve problems.

20. The library committee had a fund-raiser. Each of the four students on the committee was given three cases of pencils to sell. A case of pencils sells for \$3.00. What were their **total sales** if the individual sales were

- Kate,  $\frac{1}{2}$  case;
- Paul,  $\frac{3}{4}$  case;
- Sam,  $2\frac{1}{2}$  cases; and
- Stacey,  $1\frac{1}{4}$  cases?

- A. \$ 5.00
- B. \$ 6.00
- C. \$ 9.00
- D. \$15.00

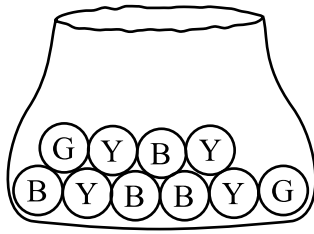
**MC#:** 20

**Key:** D

**Learning Results:** B-2

Computation

B Students will understand and demonstrate computation skills. Students will be able to  
2 create, solve, and justify the solution for multi-step, real-life problems including those with ratio and proportion.



21. The marbles marked G are green, B are blue, and Y are yellow. What is the probability of drawing a marble that is **not** blue?

- A. 80%
- B.  $\frac{3}{5}$
- C.  $\frac{2}{5}$
- D. 20%

**MC#:** 21

**Key:** B

**Learning Results:** D-1

Probability

- D Students will understand and apply concepts of probability. Students will be able to
- 1 find the probability of simple events and make predictions by applying the theories of probability.

22. Marvin purchased the following items:

- shirt for \$16.20
- slacks for \$21.50
- socks for \$2.80

If the sales tax is 6%, what is his total bill?

- A. \$ 2.43
- B. \$24.30
- C. \$42.93
- D. \$48.38

**MC#: 22**

**Key: C**

**Learning Results: B-2**

Computation

- B 2 Students will understand and demonstrate computation skills. Students will be able to create, solve, and justify the solution for multi-step, real-life problems including those with ratio and proportion.

*~ MENU ~*

**MAIN DISHES.....\$2.25**  
Pizza, Tacos, Meatloaf

**SIDE DISHES.....\$0.50**  
French Fries, Salad

**DRINKS.....\$0.75**  
Chocolate Milk, White Milk, Juice

*~ SPECIAL ~*

**COMPLETE MEAL.....\$3.00**  
1 Main Dish, 1 Side Dish, 1 Drink

23. The school cafeteria has this lunch menu. A complete meal includes 1 main dish, 1 side dish, and 1 drink. How many different combinations of complete meals are available?

A. 1  
B. 3  
C. 8  
D. 18

**MC#:** 23

**Key:** D

**Learning Results:** D-4

Probability

D Students will understand and apply concepts of probability. Students will be able to  
4 find all possible combinations and arrangements involving a limited number of variables.

24. Which description best describes the expression  $2n + 5$ ?
- A. the sum of twice a number and five
  - B. a number squared plus five
  - C. two times the sum of five and a number
  - D. five more than two numbers

**MC#:** 24

**Key:** A

**Learning Results:** H-1

Algebra Concepts

H Students will understand and apply algebraic concepts. Students will be able to  
1 use the concepts of variables and expressions.

Use the table below of normal temperatures for Caribou, Maine, to answer question 25.

Month	Temperature
Jan.	11°F
Feb.	13°F
Mar.	24°F
Apr.	37°F
May	50°F
Jun.	60°F
Jul.	65°F
Aug.	63°F
Sep.	54°F
Oct.	43°F
Nov.	31°F
Dec.	16°F

25. Which of the following is the approximate **mean** normal temperature for the entire year in Caribou, Maine?
- A. 65°F
  - B. 40°F
  - C. 25°F
  - D. 15°F

**MC#: 25**

**Key: B**

**Learning Results: C-1**

Data Analysis and Statistics

- C Students will understand and apply concepts of data analysis. Students will be able to  
1 organize and analyze data using mean, median, mode, and range.



26. If  $a = 4$ ,  $b = 3$ ,  $c = 5$ , and  $d = 5$ , what is the value of  $\frac{abc^2}{d}$ ?

- A. 60
- B. 24
- C. 6
- D. 5

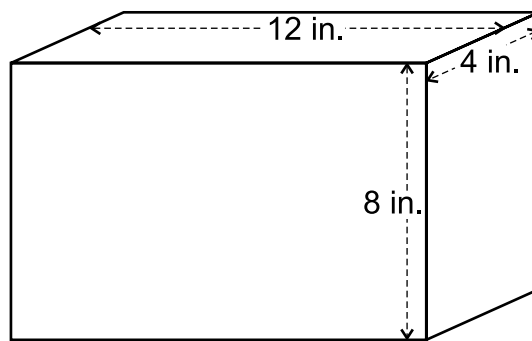
**MC#:** 26

**Key:** A

**Learning Results:** H-1

Algebra Concepts

H Students will understand and apply algebraic concepts. Students will be able to  
1 use the concepts of variables and expressions.



27. Sally wishes to keep her blocks in a box. She found a box with the interior dimensions shown above. How many blocks measuring one inch on each side will fit into the box?
- A. 24 blocks
  - B. 32 blocks
  - C. 352 blocks
  - D. 384 blocks

**MC#: 27**

**Key: D**

**Learning Results: F-3**

Measurement

- F 3 Students will understand and demonstrate measurement skills. Students will be able to demonstrate an understanding of length, area, volume, and the corresponding units, square units, and cubic units of measure.

28. In 1970, the population of Maine was approximately 1 million. It is now reported to be approximately 1.2 million. What is the **percent of increase** in population since 1970?

- A. 2%
- B. 12%
- C. 20%
- D. 83%

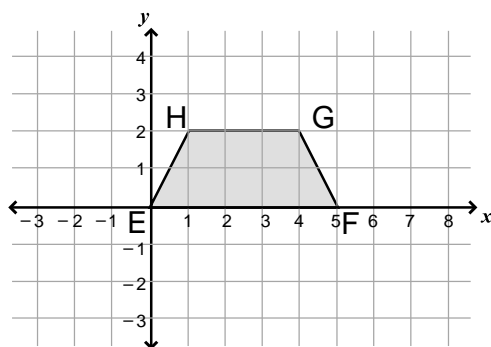
**MC#: 28**

**Key: C**

**Learning Results: B-2**

Computation

B Students will understand and demonstrate computation skills. Students will be able to  
2 create, solve, and justify the solution for multi-step, real-life problems including those with ratio and proportion.



29. What would be the coordinates of point H if figure EFGH were **translated** (slid) 2 units to the left?
- A.  $(-2, 1)$
  - B.  $(-1, 2)$
  - C.  $(-2, -2)$
  - D.  $(-1, -1)$

**MC#:** 29

**Key:** B

**Learning Results:** E-3

Geometry

E Students will understand and apply concepts from geometry. Students will be able to  
3 use a coordinate system to define and locate position.

30. What is the next term in this pattern?

1, 4, 9, 16, 25, . . .

- A. 28
- B. 30
- C. 36
- D. 41

**MC#:** 30

**Key:** C

**Learning Results:** G-3

Patterns, Relations, Functions

- G Students will understand that mathematics is the science of patterns, relationships, and functions.  
Students will be able to
- 3 use patterns and multiple representations to solve problems.

$x$	$y$
2	10
0	?
-1	1

31. The rule for this table is  $y = 3x + 4$ . What number should replace the question mark in the  $y$  column?

- A. 4
- B.  $4\frac{1}{2}$
- C. 5
- D.  $5\frac{1}{2}$

**MC#:** 31

**Key:** A

**Learning Results:** H-6

Algebra Concepts

H Students will understand and apply algebraic concepts. Students will be able to

6 find solutions for unknown quantities in linear equations and in simple equations and inequalities.

32. What is the solution to this equation?

$$3x + 7 = -5$$

- A. 4
- B.  $\frac{2}{3}$
- C.  $-\frac{2}{3}$
- D. -4

**MC#:** 32

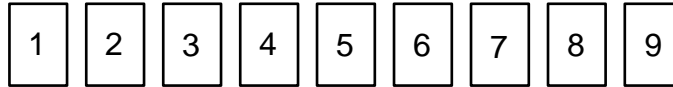
**Key:** D

**Learning Results:** H-2

Algebra Concepts

H Students will understand and apply algebraic concepts. Students will be able to  
2 solve linear equations using concrete, informal, and formal methods which apply the order of operations.

33. Chris put these cards in a box.



Without looking, he draws a card from the box.  
What is the probability he will draw a card  
showing a **multiple of 4**?

- A.  $\frac{4}{9}$
- B.  $\frac{2}{9}$
- C.  $\frac{1}{9}$
- D. 0

**MC#:** 33

**Key:** B

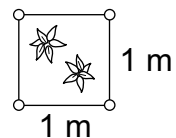
**Learning Results:** D-1

Probability

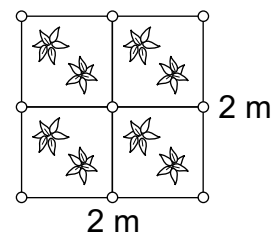
D Students will understand and apply concepts of probability. Students will be able to  
1 find the probability of simple events and make predictions by applying the theories of probability.



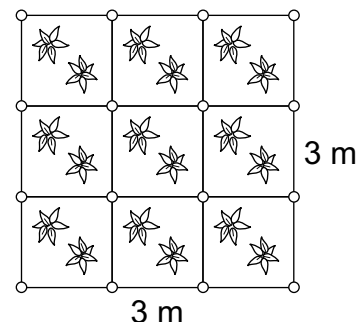
40. A square garden 1 meter on each side would need 4 sections of fencing and could support the growth of 2 tomato plants as shown at the right.



If each side of the garden is increased to 2 meters, the number of sections of fencing needed is 12 and the number of tomato plants it can support is 8.



If each side of the garden is increased to 3 meters, the number of sections of fencing needed is 24 and the number of tomato plants it can support is 18.



- Complete the table in your Student Response Booklet.
- How many tomato plants can be supported if the garden measures 100 meters on each side? Explain your answer or show calculations.
- How many tomato plants can be supported if the garden measures  $n$  meters on each side?

**CR#:** 40

**Learning Results:** F-2

Measurement

- F Students will understand and demonstrate measurement skills. Students will be able to
- 2 develop and use concepts that can be measured directly, or indirectly (e.g., the concept of rate).

## CONSTRUCTED-RESPONSE SCORING GUIDE

Score	Description
4	Student demonstrates thorough understanding of measurements related to rates of change by using appropriate strategies to solve a real-life problem in both specific and general cases.
3	Student demonstrates general understanding of measurements related to rates of change by using appropriate strategies to solve a real-life problem in both specific and general cases with only minor errors or omissions.
2	Student demonstrates basic understanding of measurements related to rates of change by using appropriate strategies to solve a real-life problem and performing some of the required procedures.
1	Student demonstrates minimal understanding of measurements related to rates of change by showing some correct strategy in performing at least one of the required procedures.
0	Response is totally incorrect or correct only in ways irrelevant to what is being measured.
Blank	No response.

### Training Notes for Constructed-Response #40

Score	Description
4	Total points: 5
3	Total points: 4
2	Total points: 2 or 3
1	Total points: 1 OR Student showed minimal understanding by showing some correct strategy.
0	Response is totally incorrect or correct only in ways irrelevant to what is being measured.
Blank	No response.

Scoring information:

Part a. 2 points if all 4 blanks are filled in correctly.

OR

1 point if 2 or 3 are filled in correctly.

Length    Fencing    Plants

4            40            32

5            60            50

Part b. 2 points for correct answer and indication of appropriate strategy

OR

1 point for correct strategy or correct answer without work shown.

Strategies will vary. A sample of a correct strategy follows.

$$\text{Number of plants} = 2 \times 100 \times 100 = \mathbf{20,000}$$

Part c. 1 point for either correct algebraic expression or explanation.

$$\text{Number of plants} = \mathbf{2n^2}$$

40.

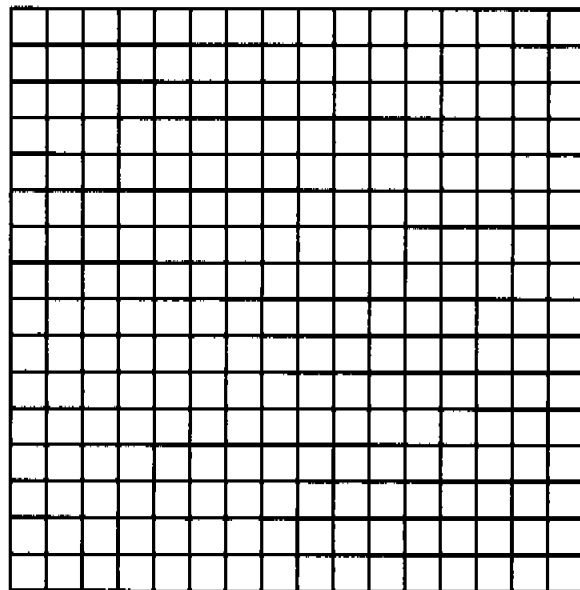
a)

Length of each side	number of sections of fencing needed	number of tomato plants
1	4	2
2	12	8
3	24	18
4	40	32
5	60	50

4

b) 20,000 tomato plants because if each side is 100 m, then  $100 \times 100 = 10,000$ . 2 tomato plants in each grid means that  $10,000 \times 2 = 20,000$  plants.

c)  $n(n \cdot 2) = \# \text{ of tomato plants}$

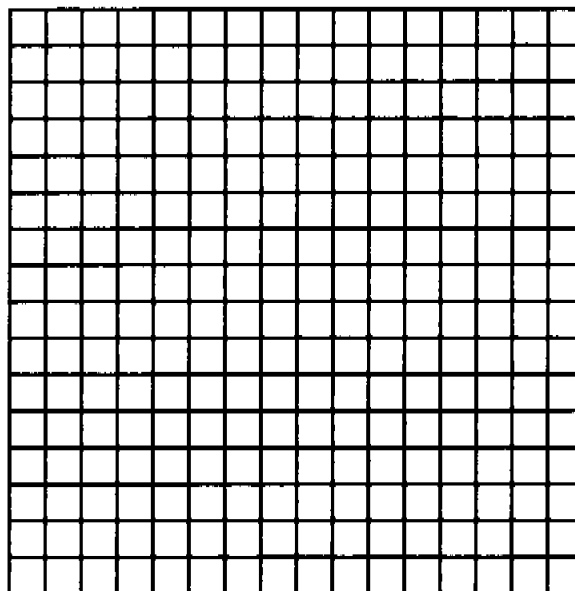


40. a.

length of each side	# of fencing sections needed	# of tomato plants
1	4	2
2	12	8
3	24	18
4	40	32
5	60	50

b.  $100^2 = 10000 \times 2$  20,000 plants

c.  $n^2 \times 2$  plants.

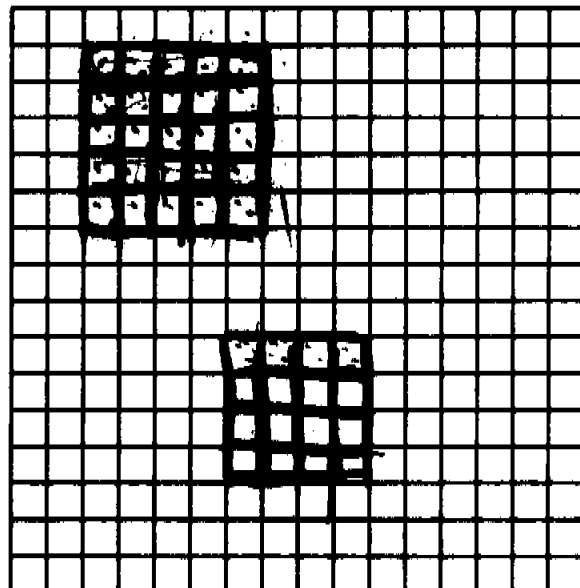


a)

length of each side	Number of sections of fencing needed	number of tomato plants
1	4	2
2	12	8
3	24	18
4	40	32
5	60	50

b) 100 meters ~~area~~ tomato plants

$$\begin{array}{r} 200 \\ \times 100 \\ \hline 20,000 \end{array}$$

c) Not enough info.

40.

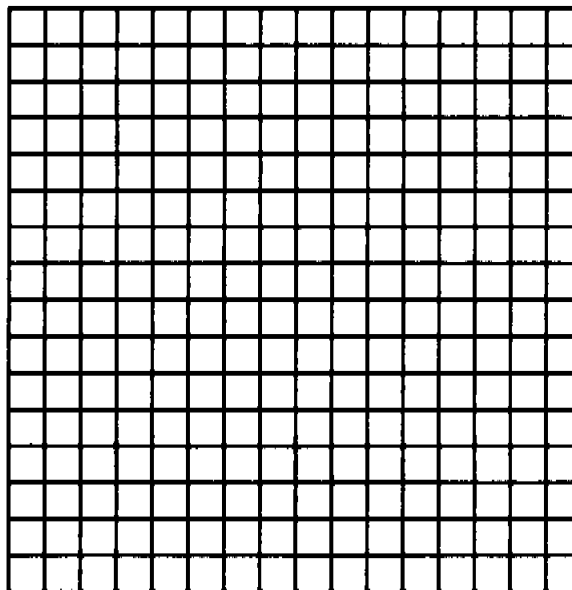
3

a.) length of Each Side      # of sections of fencing needed      # of Tomato plants

1	4	2
2	12	8
3	24	18
4	40	32
5	60	50

b.)  $\begin{array}{r} 100 \\ 100 \overline{) 10000} \end{array}$  Area =  $100 \times 100 = 10000$   
 $10000 \times 2 \text{ plants} = 20000 \text{ plants}$

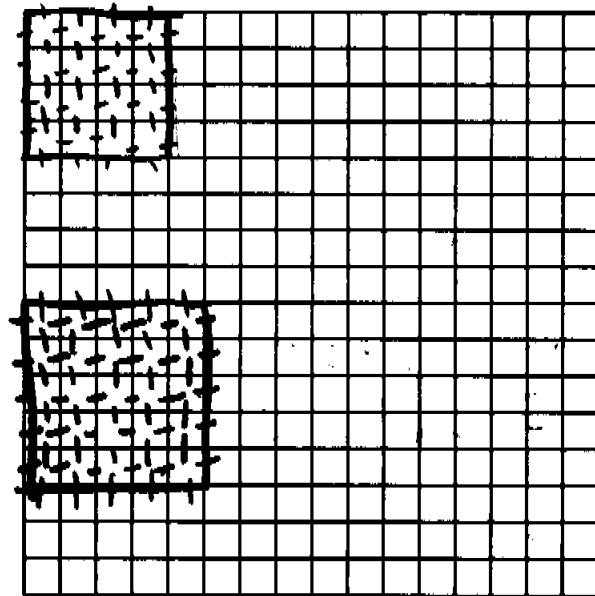
c.)  $(n \times n) 2 = \text{tomato plants supported.}$



Length of Each Side	Number of sections of fence needed	Number of tomatoes
1	4	2
2	12	8
3	24	18
4	40	32
5	60	50

$$\begin{array}{r} 100 \\ \times 2 \\ \hline 200 \end{array}$$
 200 tomato plants can be supported with 100m on each side

$$T = N^2$$





A.

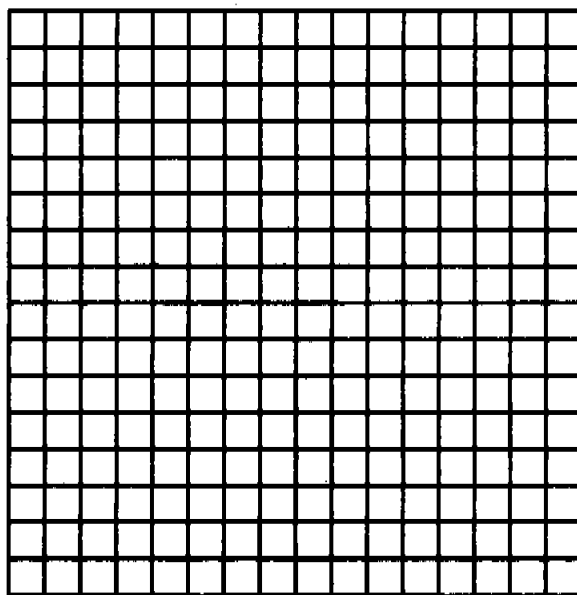
Length of each side	# of fencing sections needed	Total Tomato Plants
1	$\times 2$ 4	2
2	$\times 2$ 12	8 + 6
3	$\times 2$ 24	18 + 16
4	$\times 2$ 48	32 + 24
5	$\times 2$ 96	50 + 32

+ by 4  
each time  
starting at  
6.

B. 20,000 Tomato plants can be supported by a  $100 \times 100$  section of fencing. I found my answer by multiplying  $100 \times 100 = 10,000$  then doubling it to 20,000.

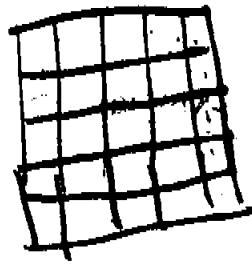
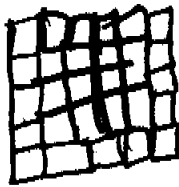
C. If the garden measured  $n$  meters on each side the garden, the equation would look like this...

$$\begin{aligned} \text{# of fencing sections} &= n \times 2 \\ \text{total plants} &= n + (n + 4) = 2n + 4 \\ \text{length of side} &= n + 1 \end{aligned}$$



40.

(A)

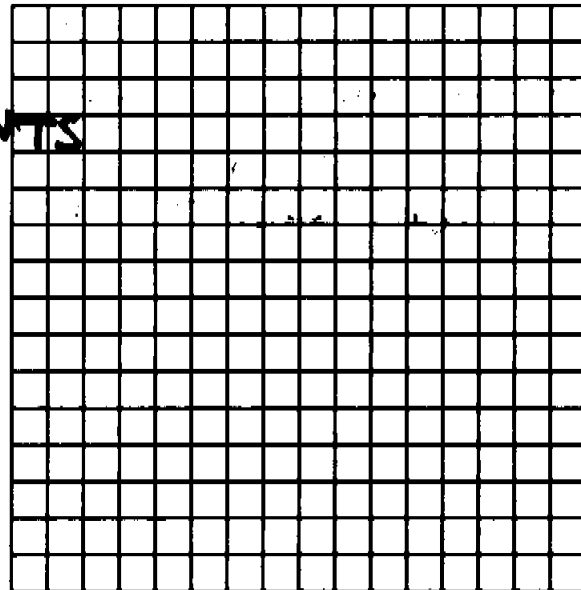


$$\begin{array}{r} 20 \\ 40 \\ \hline 60 \end{array}$$

1

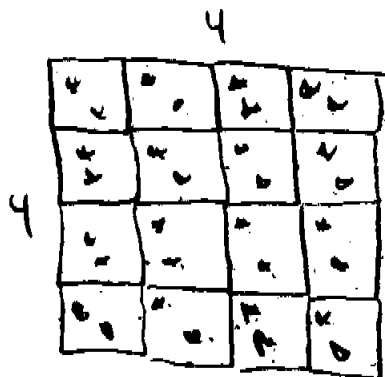
1	4	2
2	12	6
3	24	16
4		
5		

B) IF THE SIDES  
ARE 100 M LONG  
THEN THERE ARE  
20,000 PLANTS



(a.)

Length of Each Side	Number of Sections of Fencing Needed	Number of Tomato Plants
1	4	2
2	12	8
3	24	18
4	37	32
5	59	50



100 = Meters    2 = Tomatoes

(b.)

$$\begin{array}{r} 100 \\ \times 100 \\ \hline 10,000 \end{array} \quad \begin{array}{r} 100 \\ \times 2 \\ \hline 200 \end{array}$$

1000 = meters

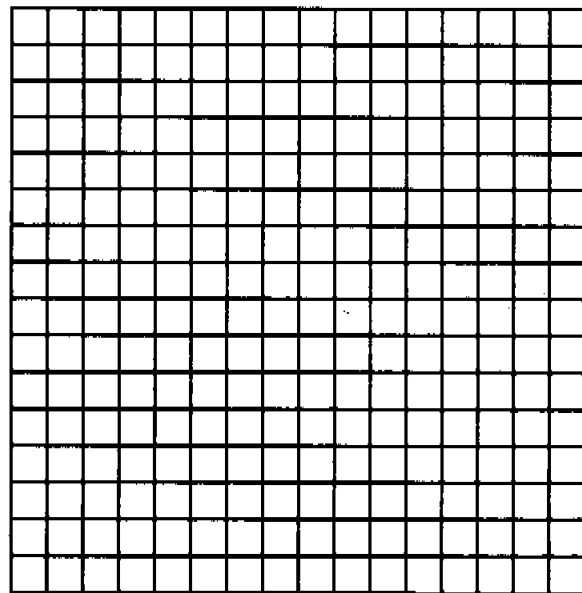
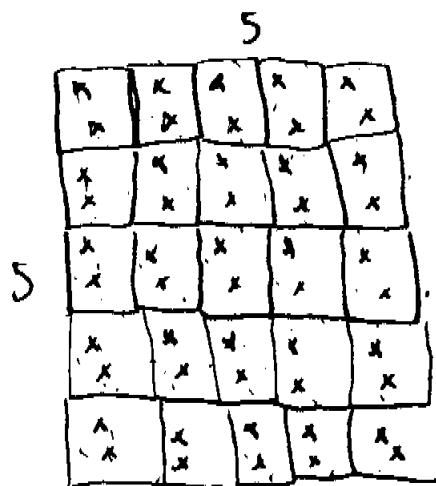
200 = Tomatoes

(c.) 200 = meters    2 = Tomatoes

$$\begin{array}{r} 200 \\ \times 200 \\ \hline 40,000 \end{array} \quad \begin{array}{r} 200 \\ \times 2 \\ \hline 400 \end{array}$$

40,000 = Meters

400 = Tomatoes



41. The computer club at school designed a Web site to provide information to students about school activities, events, schedules, assignments, etc. The club decided to keep track of the number of students who accessed the Web site each week. The results are shown in the table below.

Week	Number of students accessing the Web site
1	21
2	75
3	104
4	152
6	204
7	240
10	290

- On the grid in your Student Response Booklet, plot the data. Be sure to indicate your scale and use appropriate labels. Notice that the data from Weeks 5, 8, and 9 are missing.
- The club did not record the actual number of students who accessed the Web site during Week 5. Week 5 was typical of the data recorded. Estimate the number of students who accessed the site during Week 5. Explain how you found your answer.
- If the trend shown in your graph continues, what is the most likely number of students who will access the site during Week 13? Explain how you found your answer.

**CR#: 41**

**Learning Results: G-1**

Patterns, Relations, Functions

G Students will understand that mathematics is the science of patterns, relationships, and functions. Students will be able to

1 describe and represent relationships with tables, graphs, and equations.

## CONSTRUCTED-RESPONSE SCORING GUIDE

Score	Description
4	The student demonstrates a thorough understanding of the use of tables and graphs to represent real-life situations by correctly graphing a set of data and using the graph to interpolate and extrapolate information.
3	The student demonstrates an understanding of the use of tables and graphs to represent real-life situations by correctly graphing a set of data and using the graph to interpolate and extrapolate information, with only minor errors.
2	The student shows some understanding of graphing data or of interpolating or extrapolating data.
1	The student shows minimal understanding of graphing or interpreting data.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

### Training Notes for Constructed-Response #41

Score	Description
4	4 points
3	3 points
2	2 points
1	1 point OR Student shows minimal understanding of making and/or interpreting graphs.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Part a. 2 points if the student correctly graphs the data, has correct scale, and labels axes correctly. Both horizontal and vertical scales must be correct no matter what type of graph is made (including bar graphs.).

OR

1 point if the student graphed at least 4 points correctly with scale that may contain a minor error, but failed to label axes.

Part b 1 point for an explanation that yields an estimate of  $175 \pm 10$

Part c 1 point for an explanation that yields a reasonable estimate.

If student shows an extension of the graph and gives a reasonable estimate but there is no explanation, award 1 point unless it is a score 4 paper.

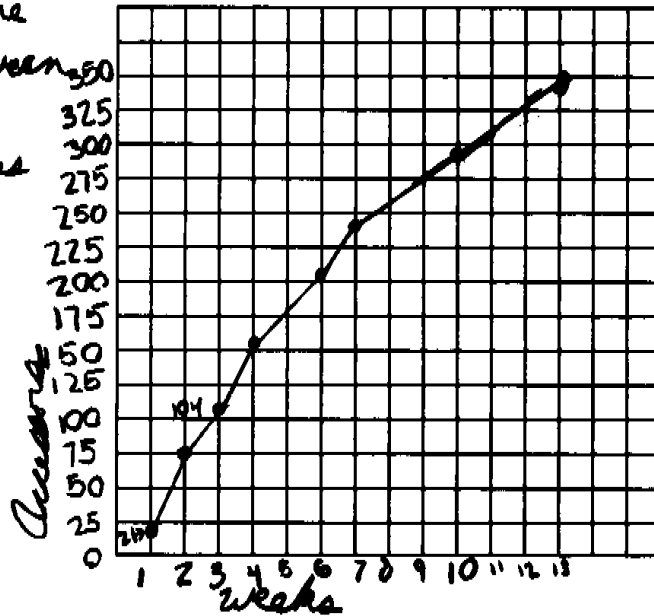
Some examples of acceptable answers follow.

1. I drew a best fit line and read the number of students at Week 13. (Using this method, an estimate in the range of  $400 \pm 10$  is acceptable.)
2. I continued the curve to Week 13 and read off the number of students. (Using this method, student's estimate must be reasonable,  $\pm 10$  of the value on the student's graph.)
3. Week 13 is 3 weeks later than Week 10 and Week 10 is 3 weeks from Week 7.  
 $290 - 240 = 50$ , and  $290 + 50 = 340$ . (Using this method, an estimate of 340 is acceptable.)

41.

b. I wrote week 5 on a column on the graph to estimate how many accessors there were that week. My estimate is 175 because that was the accessor line between 4 and 6 rows. My estimate is 175 accessors in week 5.

c. I estimate is 350 accessors in week 13 because when the line stays and the level of ascent its at now it reaches 350 by week 13.

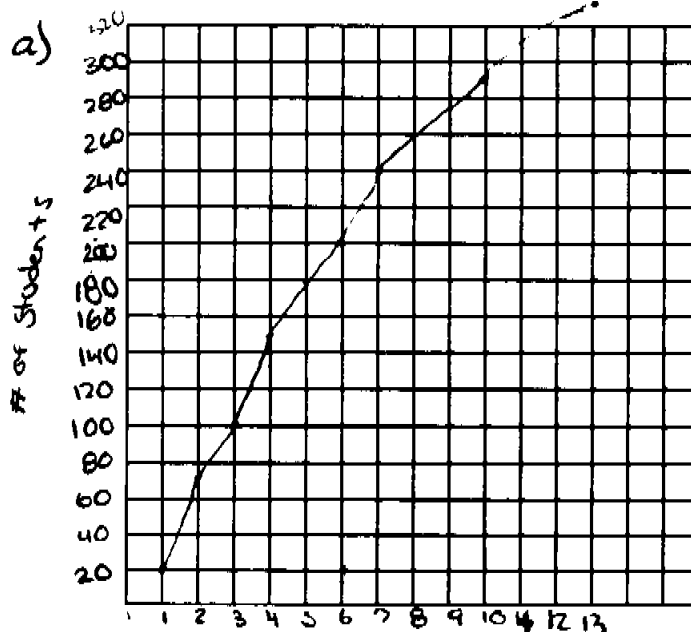


4

41.

b) I estimate around 180 kids used it because looking at the growth rates of the others, 180 fits in very well.

c) Around 330 because if the growth rate doesn't change and continues this way by week 13, 330 is a good week estimate!



4

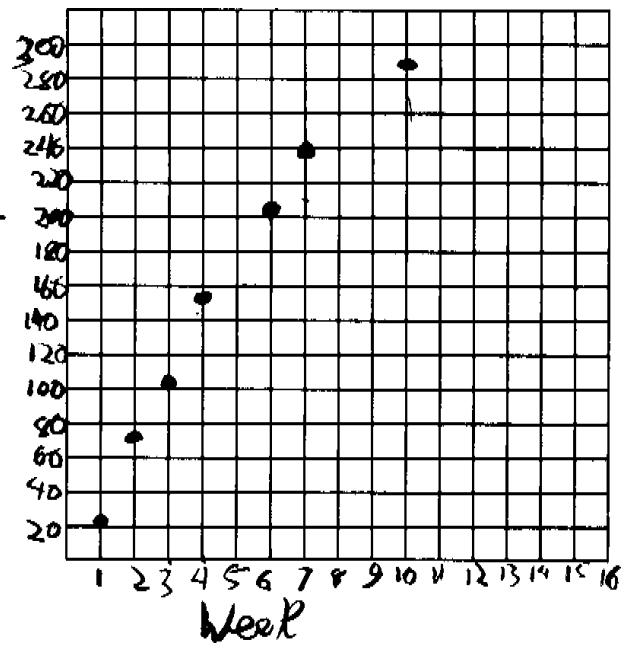
41.

3

b. 177- the pattern  
is +25, +50, +25

c. 390 I used  
the pattern

#  
of  
Students

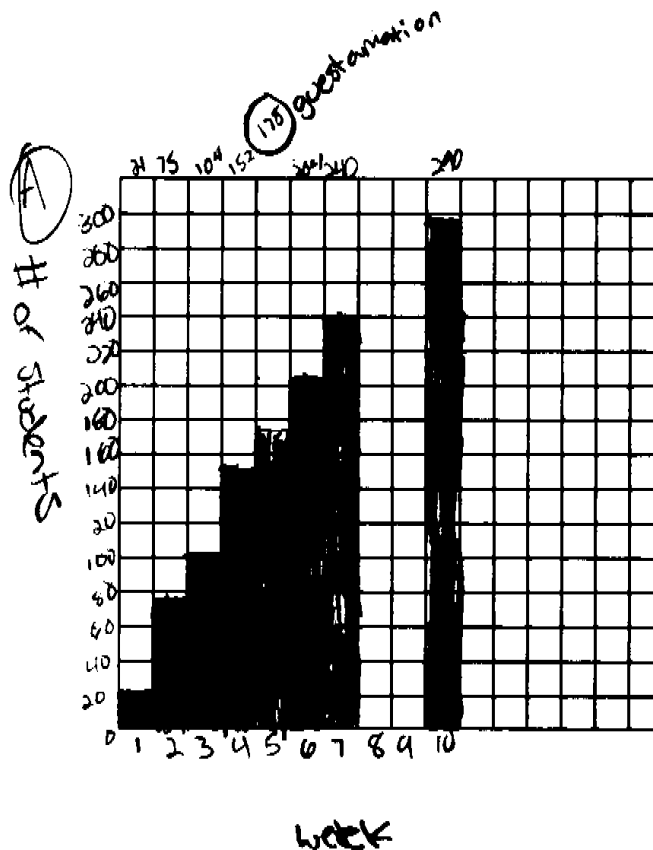


41.

3

(c) 360  
question

(B) 178 I  
gues  
questioned

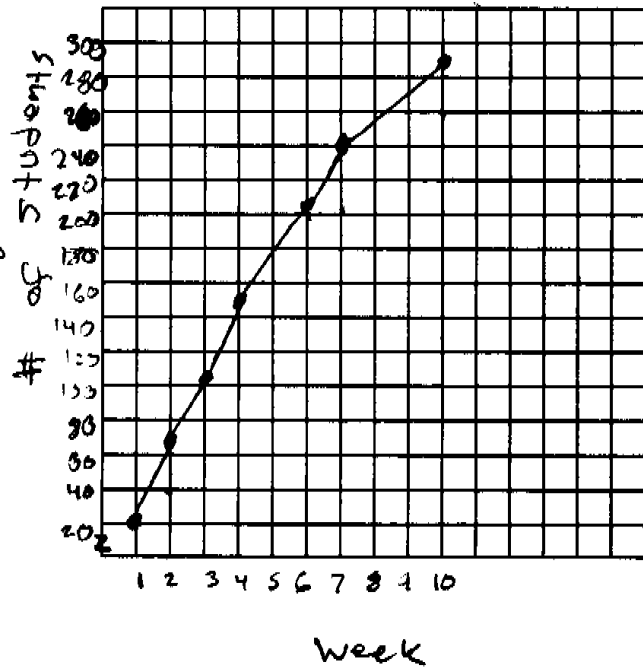




41.

2

A



B About 150 kids. I found this by following the graph. I found week # 5 and then went up until I hit the line.

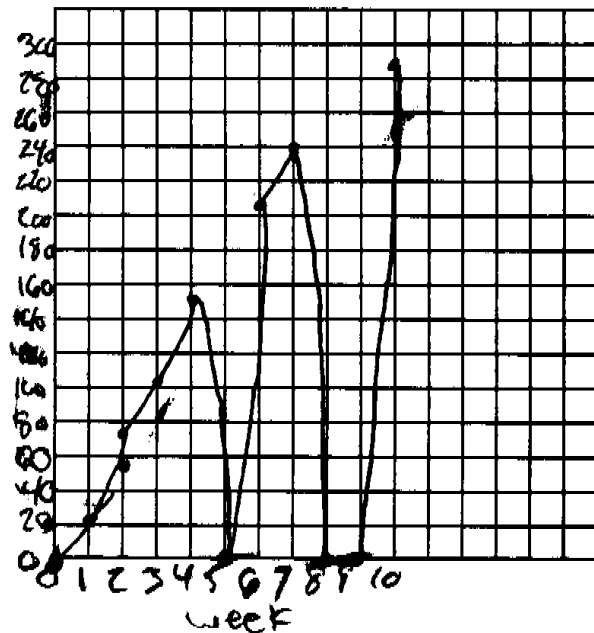
C About 389 kids. I found the slope then multiplied by 13.

41.

2

178 because I added 152 with 204 and got 356 then I divided it by 2.

I'm guessing 390 because they are increasing by like 40 and 50's

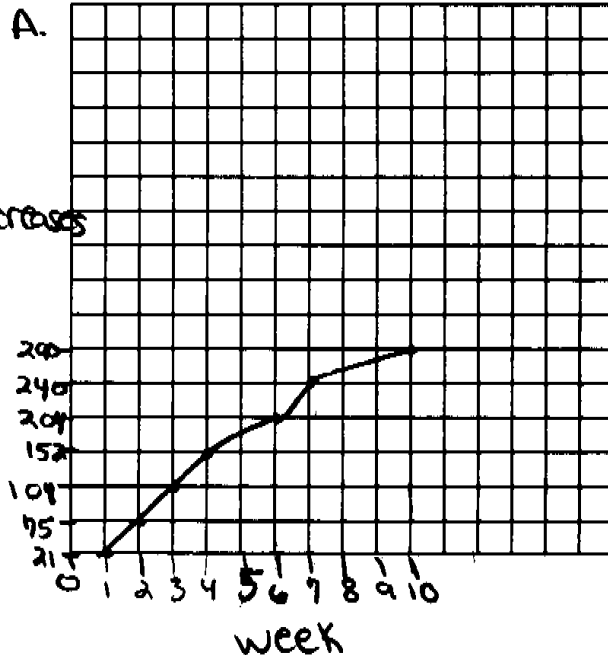


41.

1

B. 178. I got this by finding the number half inbetween 4 and 6.

C. 440 students. It increases on average of 50 students each week. I did  $290 + 50 + 50 + 50$  to get 440.



41.

1

B I took all the data added it up and divided it by 7. I got 155. Since that is the average I thought week 5 might be around there

C 394. I got this because I added weeks 10 with week 3

